

FIROUZI CONSULTING ENGINEER, INC.

SKYTRON SURGICAL PRODUCTS

DES.

SHEET

STELLAR SERIES - ST 232323 / ST232323TV
FOR SEISMIC ZONE (4), SOIL PROFILE (Sd)
NEAR SOURCE FACTOR = 1.5

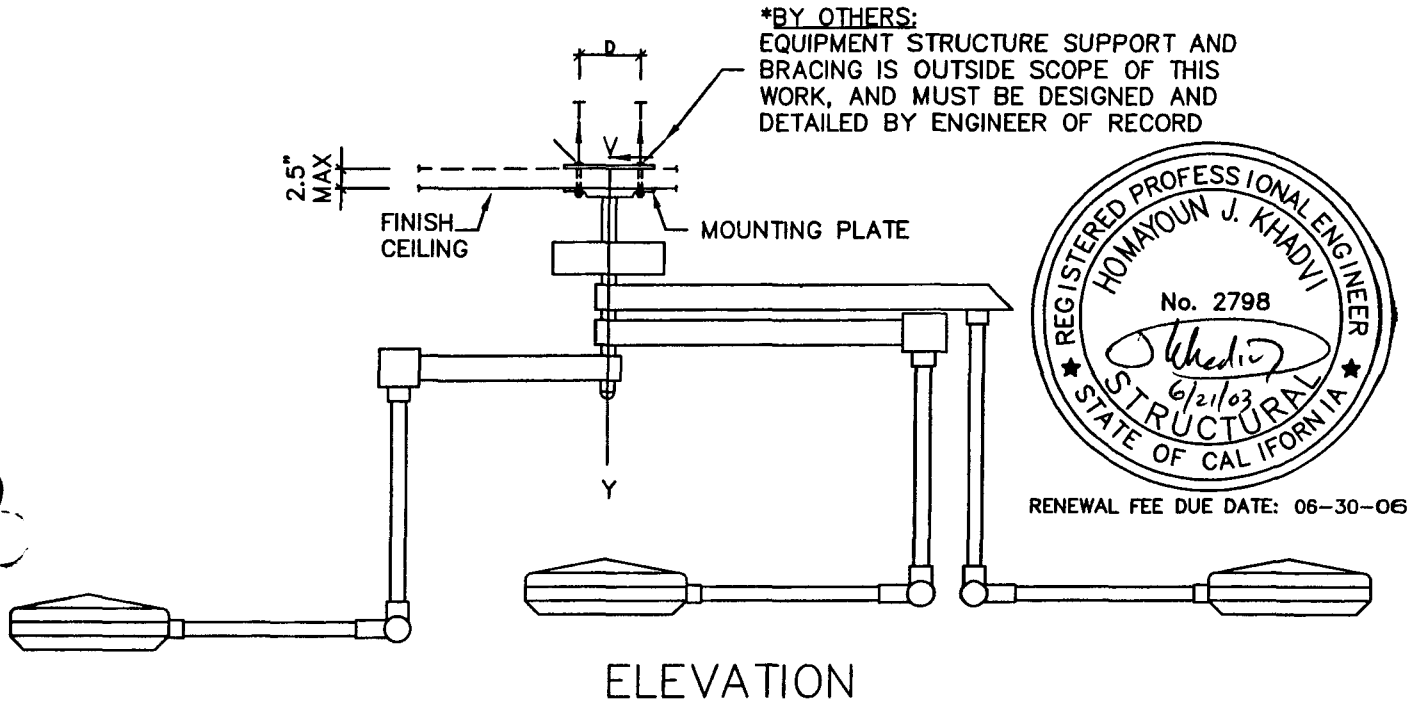
FCE
JOB No.

1

DATE: 6-21-03

OF 4 SHEETS

SEISMIC ANCHORING BOLT DESIGN ST232323/ST232323TV



NOTES:

1. SCOPE OF WORK: DESIGN OF BOLTS CONNECTING MOUNTING PLATE TO STRUCTURE ONLY.
2. FORCES ARE DETERMINED PER 2001 CALIFORNIA BUILDING CODE - SECTION 1632A, (INCLUDING UP TO DATE REVISIONS) AND HAVE BEEN FACTORED TO REPRESENT WORKING DESIGN LOADS, NOT ULTIMATE
3. FORCES ARE MAXIMUMS AND OCCUR WHEN EQUIPMENT IS MOVED TO ITS MOST ECCENTRIC POSITION.
4. PROVIDE CEILING STRUCTURE DESIGNED AND DETAILS TO SUPPORT WEIGHTS AND FORCES SHOWN (BY ENGINEER OF RECORD FOR THE BUILDING)
5. ENGINEER OF RECORD TO DESIGN, DETAIL AND VERIFY STRUCTURE AND/OR EXISTING LIGHT SUPPORT TRACTS TO SUPPORT INDICATED LOADS
6. HORIZONTAL FORCES AND MOMENT MAY OCCUR IN ANY DIRECTION, ACTING AT THE TOP OF MOUNTING PLATE.

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DESIGN CRITERIA:

FORMULA 32A-1: $F_p = 4.0 C_a I_p W_p$

TABLE 16A-Q : $C_a = 0.44 N_a = 0.44 * 1.5 = 0.66$ (For zone 4 & Sd)

TABLE 16A-K : $I_a = 1.5$ (For essential facility)

$\therefore F_p = (4.0)(0.66)(1.5)W_p = 3.96 W_p$ (For LRFD)

$F_p = 3.96 W_p / 1.4 = 2.83 W_p$ (For ASD)

FORMULA 30A-1: $E = p E_h + E_v$

$E_h = F_p$

$p = 1.0$ (FOR COMPONENT)

$E_v = (0.5) C_a I_p W_p$

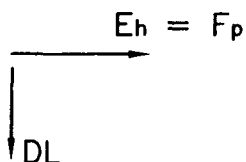
$= (0.5)(0.66)(1.5)W_p = 0.5 W_p$ (For LRFD)

$= 0$ (For ASD)

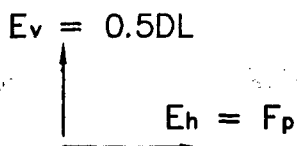
SECTION 1630A.11: $E_v = (0.7) C_a I W_p$

$= (0.7)(0.66)(1.5)/1.4 = 0.5 W_p$ (For ASD) [NET UPLIFT FORCE]

LOAD COMBINATION CASE A



LOAD COMBINATION CASE B



BY COMPARISON LOAD, COMBINATION A GOVERNS

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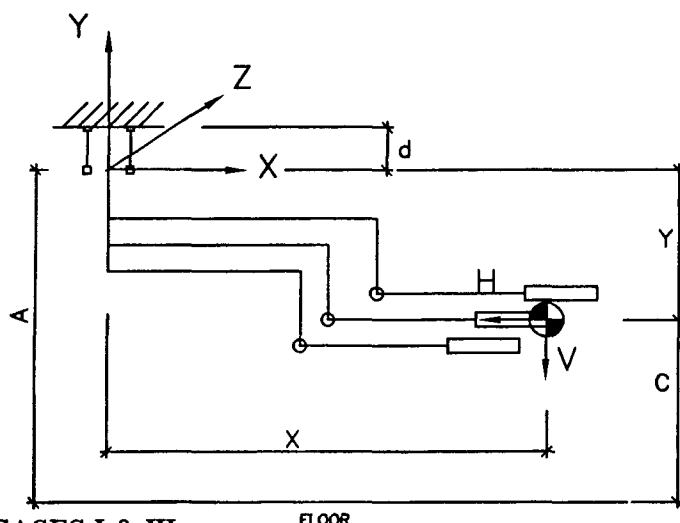
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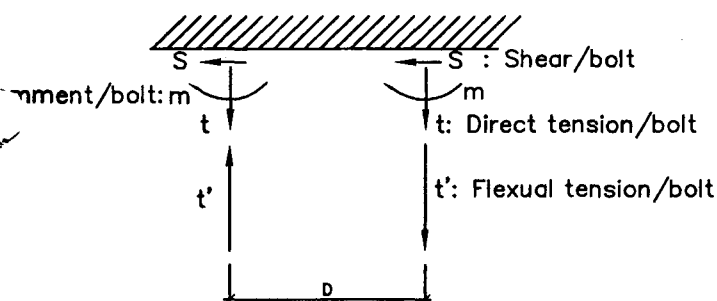
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OF 4 SHEETS



CASES I & III



A: MAX FLOOR TO MOUNTING PLATE
DISTANCE

$$A = 10'-0" = 120"$$

$$C = 80"$$

Vd : Dead Load

Ve : Vertical Seismic Load

He : Horizontal Seismic Load

CASE I (Fixture At High Position)

$$d = 2.5"$$

$$D = 9.5"$$

$$Vd = 304 \#$$

$$Y = A - C = 120 - 80 = 40"$$

$$X = (86 + 78 + 70.5) / 3 = 78"$$

$$Ve = 0.50 \times 304 = 150.5 \#$$

$$He = 2.83 \times 304 = 859.9 \#$$

$$S = 859.8 / 4 = 215.0 \# \text{ per bolt}$$

$$t = (304 + 150.48) / 4 = 113.62 \# \text{ per bolt}$$

$$\text{Total } M_{zz} = (304 + 150.5) \times 78.1 + 859.8 \times 40 = 69921 \text{ \"#}$$

$$t' = 69921 / (9.5 \times 2) = 3680 \# \text{ per bolt}$$

$$m = 215.0 \times 2.5 = 537 \text{ \"# per bolt}$$

CASE II (Fixture At Low Position)

$$d = 2.5"$$

$$D = 9.5"$$

$$Vd = 304 \#$$

$$Y = A - C + 35 = 75"$$

$$X = (50.5 + 43 + 35.2) / 3 = 42.9"$$

$$Ve = 0.50 \times 304 = 150.5 \#$$

$$He = 2.83 \times 304 = 859.9 \#$$

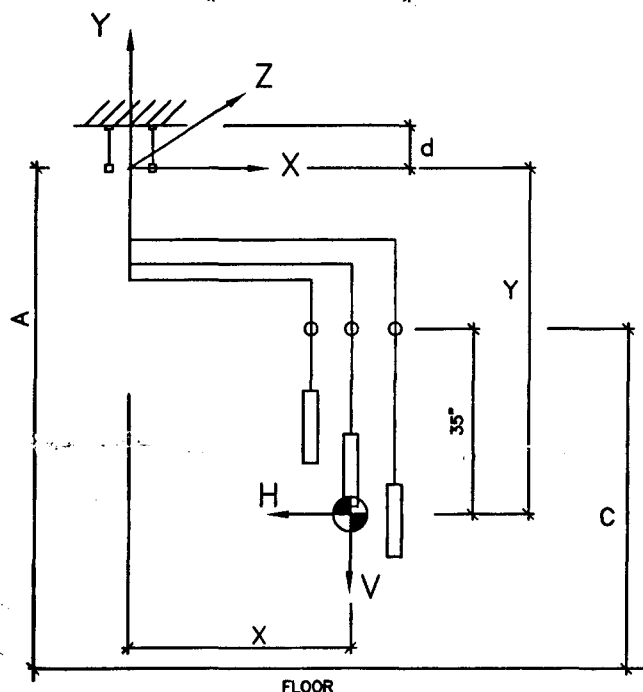
$$S = 859.8 / 4 = 215.0 \# \text{ per bolt}$$

$$t = (304 + 150.48) / 4 = 113.6 \# \text{ per bolt}$$

$$\text{Total } M_{zz} = (304 + 150.5) \times 42.9 + 859.8 \times 75 = 83989 \text{ \"#}$$

$$t' = 83989 / (9.5 \times 2) = 4420 \# \text{ per bolt}$$

$$m = 215.0 \times 2.5 = 537.4 \text{ \"# per bolt}$$



CASES II & IV

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CASE III (Same As CASE I, Lateral Forces Applied Diagonally To Mounting Plate)

$$d = 2.5''$$

$$R = 13.4''$$

$$V_d = 304 \#$$

$$Y = 40''$$

$$X = 78.1''$$

$$V_e = 0.50 \times 304 = 150.5 \#$$

$$H_e = 2.83 \times 304 = 859.9 \#$$

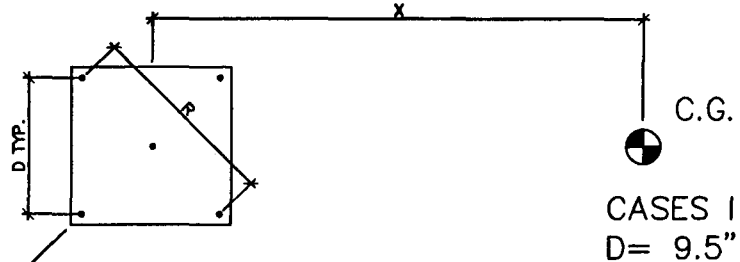
$$S = 859.8 / 4 = 215.0 \# \text{ per bolt}$$

$$t = (304 + 150.48) / 4 = 113.6 \# \text{ per bolt}$$

$$\text{Total } M_{zz} = (304 + 150.48) \times 78.1 + 859.8 \times 40 = 69921 \text{ ''\#}$$

$$t' = 69921 / (13.4 \times 1) = 5204 \# \text{ per bolt}$$

$$m = 215.0 \times 2.5 = 537.4 \text{ ''\# per bolt}$$



CASES I & II
D = 9.5''

CASE IV

Same As CASE I, Lateral Forces Applied Diagonally To Mounting Plate)

$$d = 2.5''$$

$$R = 13.4''$$

$$V_d = 304 \#$$

$$Y = 75''$$

$$X = 42.9''$$

$$V_e = 0.50 \times 304 = 150.5 \#$$

$$H_e = 2.83 \times 304 = 859.9 \#$$

$$S = 859.8 / 4 = 215.0 \# \text{ per bolt}$$

$$t = (304 + 150.48) / 4 = 113.62 \# \text{ per bolt}$$

$$\text{Total } M_{zz} = (304 + 150.48) \times 42.9 + 859.8 \times 75 = 83989 \text{ ''\#}$$

$$t' = 83989 / (13.4 \times 1) = 6251 \# \text{ per bolt GOVERNS}$$

$$m = 215.0 \times 2.5 = 537.4 \text{ ''\# per bolt}$$



CASES III & IV
 $R = 9.5(2)^{0.5} = 13.4''$

CHECK 3/4" DIA. A490 BOLTS:

ALLOWABLE TENSION: 23,900#

ALLOWABLE SHEAR: 9,280#

$$S = 3.14 \times d^3 / 32 = 3.14 \times (0.75)^3 / 32 = 0.04''^3$$

$$\sigma = 537.4 / 0.04 = 12982 \text{ PSI}$$

$$\tau = 0.75 \times 36000 = 27000 \text{ PSI}$$

$$f_v / F_v + f_t / F_t + f_b / F_b = 0.02 + 0.26 + 0.48 = 0.76 < 1.0 \text{ OK}$$

USE 3/4" DIA. A490 BOLTS